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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/551,689	09/30/2005	Huijun Zhao	21854-00064-US1	5982
30678 7590 11/07/2008 CONNOLLY BOVE LODGE & HUTZ LLP 1875 EYE STREET, N.W. SUITE 1100 WASHINGTON, DC 20006				
EXAMINER				
XU, XIAOYUN				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/551,689

**Applicant(s)**

ZHAO, HUIJUN

**Examiner**

ROBERT XU

**Art Unit**

1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 30 September 2005.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-17 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 30 September 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO-8508)  
Paper No(s)/Mail Date 9/30/2005  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Objections*

1. Claim 17 is objected to because of the following informalities: it does not have a period at the end of the claim, which makes it unclear, as to whether the claim is completed. Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. **Claims 1-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. (Journal of Photochemistry and Photobiology A: Chemistry, 2001) (Jiang).

In regard to Claim 1, Jiang teaches method of photoelectrochemical oxidation of methanol in water using nanoporous TiO<sub>2</sub> film electrodes device (see abstract). The method comprising the steps of

a) applying a constant potential bias to a photoelectrochemical cell (see page 197, right col. Lines 10-13; page 199, Figure 1), having a photoactive working electrode ( $\text{TiO}_2$  film electrode) and a counter electrode (platinum mesh) (see page 198, 2.3. *Apparatus and methods*, lines 1-4), and containing a supporting electrolyte solution (0.5 M  $\text{Na}_2\text{SO}_4$  solution) (see Figure 1);

b) illuminating the working electrode with a light source and recording the background photocurrent produced at the working electrode from the supporting electrolyte solution (see Figure 1, curve b; page 198, 3.1. *Influence of applied potential and methanol concentration*, lines 7-12).

c) adding a water sample, to be analyzed, to the photoelectrochemical cell (see Figure 1, curve c-f; page 198, 3.1. *Influence of applied potential and methanol concentration*, lines 9-12);

d) illuminating the working electrode with a light source and recording the total photocurrent produced with the sample (see Figure 1, curve c-f; page 198, 3.1. *Influence of applied potential and methanol concentration*, lines 9-12);

e) Jiang teaches determining the amount of methanol being oxidized at concentration from 0.5 mM to 0.75M (see Figure 1, curve (c) – (f)). Therefore, Jiang teaches determining the amount of organic compound oxidized in water in different type of degradation conditions.

Jiang does not explicitly teach measuring the chemical oxygen demand of the water sample. However, Jiang teaches that  $\text{TiO}_2$  films are employed to oxidize organic wastes in water (see page 197, left col, 1<sup>st</sup> paragraph). It is well known in the art that the

amount of oxygen used to oxidize the compound is called oxygen demand. Therefore, the amount of organic compound in water to be oxidized is directly related to the amount of oxygen required for such oxidation, in other words, to the oxygen demand. Thus, by measuring the amount of organic compound (methanol) oxidized in the water sample through photoelectrochemical oxidation (see abstract), the amount of oxygen required for such oxidation can be easily derived. It would have been obvious for a person of ordinary skill in the art to use Jiang's method of determining the amount of methanol (or any other organic material) in a water sample, which is oxidized by a photochemical oxidation, for determining the amount of oxygen required for such oxidation, in other words, the oxygen demand, because it is an important parameter for controlling the organic waste in the water sample, as taught by Jiang.

In regard to Claim 11, as has been discussed in regard to Claim 1 above, the organic carbon content of water is equivalent to chemical oxygen demand of water. They both are measures for the same organic contamination in water. Jiang teaches a photoelectrochemical assay apparatus for determining organics (e.g. methanol) concentration in water (see abstract). The apparatus consists of

- a) a measuring cell (see 2.3. *Apparatus and methods*)
- b) a photoactive working electrode ( $\text{TiO}_2$ ) and a counter electrode (platinum mesh),
- c) a light source to illuminate the photoactive working electrode (150W xenon lamp with focusing lenses).

d) control means to control the illumination of the working electrode (see 2.3. Apparatus and methods, lines 11-15), the applied potential bias (see 2.3. *Apparatus and methods*, lines 5-8), and photocurrent recording (see 2.3. *Apparatus and methods*, lines 5-9),

e) photocurrent/charge measuring means to measure the photocurrent/charge at the working electrode (see 2.3. *Apparatus and methods*, lines 5-9),

f) analysis means to derive the concentration of oxidized organics (methanol) from the measurement (see Figure 1-3, 3.1. *Influence of applied potential and methanol concentration*).

Jiang does not explicitly disclose analysis means to derive a measure of oxygen demand from the measurements made by the photocurrent/charge measuring means. However, measuring the concentration of oxidized organics (methanol) is directly related to measuring the oxygen demand, and therefore it would have been obvious for a person of ordinary skill in the art to slightly modify Jiang's apparatus by replacing the analysis means to derive the concentration of oxidized organics disclosed by Jiang, with the analysis means to derive a measure of oxygen demand, because both types of the analysis means are related to determining amount of organic matter in the sample.

In regard to Claims 2 and 14, Jiang discloses that the working electrode is a nanoparticulate semiconductive electrode (see page 198, left col., lines 35-36).

In regard to Claims 3 and 15, Jiang discloses that the working electrode is a layer of titanium dioxide nanoparticles coated on an inert conductive substrate (see page 198, 2.2. *Preparation of the nanoporous TiO<sub>2</sub> electrode*).

In regard to Claims 4 and 13, Jiang discloses that a reference electrode is also used in addition to the working and counter electrodes (see page 198, 2.3. *Apparatus and methods*).

In regard to Claim 7, Jiang teaches measuring the photocurrent under illumination when no methanol is added (see Figure 1, curve (b)). This measurement is the background photocurrent.

In regard to Claim 8, Jiang discloses that in the high methanol concentration region, the deviation from the straight line is observed (see page 199, left col. lines 5-6, Figure 3). Although Jiang does not explicitly teach diluting the sample with the supporting electrolyte solution, it would have been obvious to one of ordinary skill in the art to do so in order to obtain the linear response of the measurement.

In regard to claims 5, 6, 9, 10 and 12, Jiang teaches measuring the amount of oxidized methanol (organic matter) under exhaustive degradation condition (0.5 mM methanol) (see Figure 1 (c)) and non-exhaustive degradation condition (0.75 M methanol) (see Figure 1 (f)). Jiang discloses a batch mode operation (see 2.3. *Apparatus and methods*).

Jiang does not explicitly teach measuring the chemical oxygen demand of the water sample. However, as it has been specifically expressed above, it would have been obvious to one of ordinary skill in the art to use Jiang's method of determining the amount of methanol (or any other organic material) in a water sample, which is oxidized by a photochemical oxidation, for determining the amount of oxygen required for such

oxidation, i.e. the oxygen demand, because it is an important parameter for controlling the organic waste in the water sample, as taught by Jiang.

In regard to Claim 16, Jiang does not explicitly teach using a reservoir for a supporting electrolyte. However, Jiang teaches using supporting electrolyte to measure the background photocurrent (see Figure 1, curve (b)). Since a solution needs to be hold in a container or reservoir, a reservoir for supporting electrolyte is inherent to Jiang's apparatus.

5. **Claim 17** is rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang in view of Blades et al. (US Patent 4,868,127) (Blades).

In regard to Claim 17, Jiang does not explicitly teach sample and supporting electrolyte supplying/injection system. Blades explicitly teaches the supplying/injection system (see Claims 11 and 12). It would have been obvious for a person of ordinary skill in the art to modify Jiang's apparatus by incorporating Blades' supplying/injection system, because it allows automating Jiang's apparatus.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT XU whose telephone number is (571)270-5560. The examiner can normally be reached on Mon-Thur 7:30am-5:00pm, Fri 7:30am-4:00pm.



If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571)272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

11/6/2008

/Yelena G. Gakh/  
Primary Examiner, Art Unit 1797

RX